
# US-CMS & Grid Interoperability

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# LHC Grids comprises of

- US grids (Open science grid **OSG**)
  - Uses virtual data catalog (**VDT**)
- LCG grids
  - Uses LHC computing grid project (**LCG**) that is built using some components of VDT. Support for LCG grid is provided by EGEE
- Nordu grids
  - Is a separate independent grid.

Some underlying technologies and protocols between the two types of grids are similar.

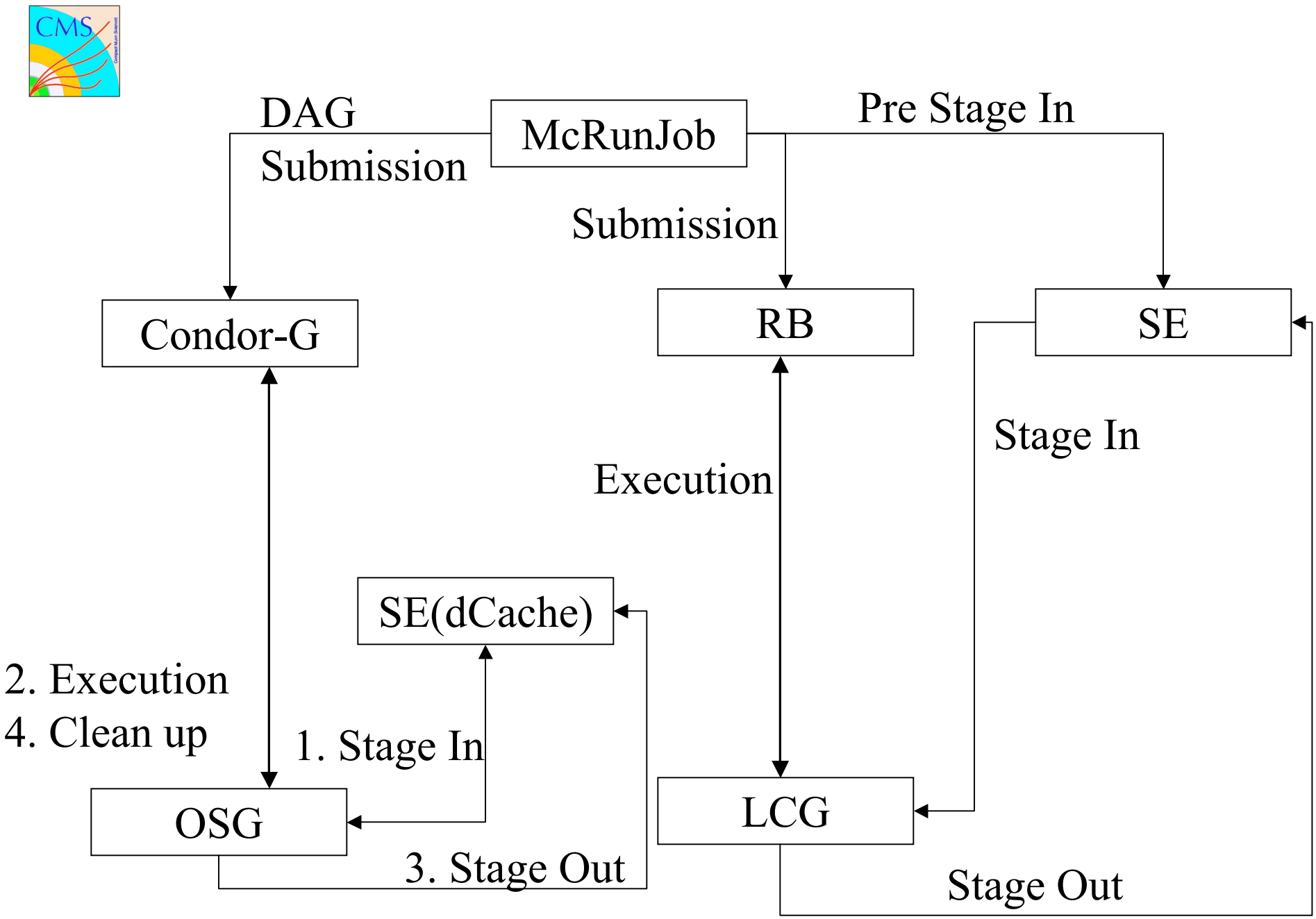

# Interoperations

- Application generation & submission.
  - Preparation of the job such that it can be successfully queued to the particular type of grid.
  - Submission of the job such that it can use the interface provided by the particular type of grid.
- Application execution.
  - Site ability to expose interfaces of both grids and to execute the job in a coherent way.


# Application Generation and Submission

McRunjob was created in February of 2004 following on the successful attempt to isolate and re-engineer the common components between the existing (and related) DZero Runjob software and CMS McRunjob software

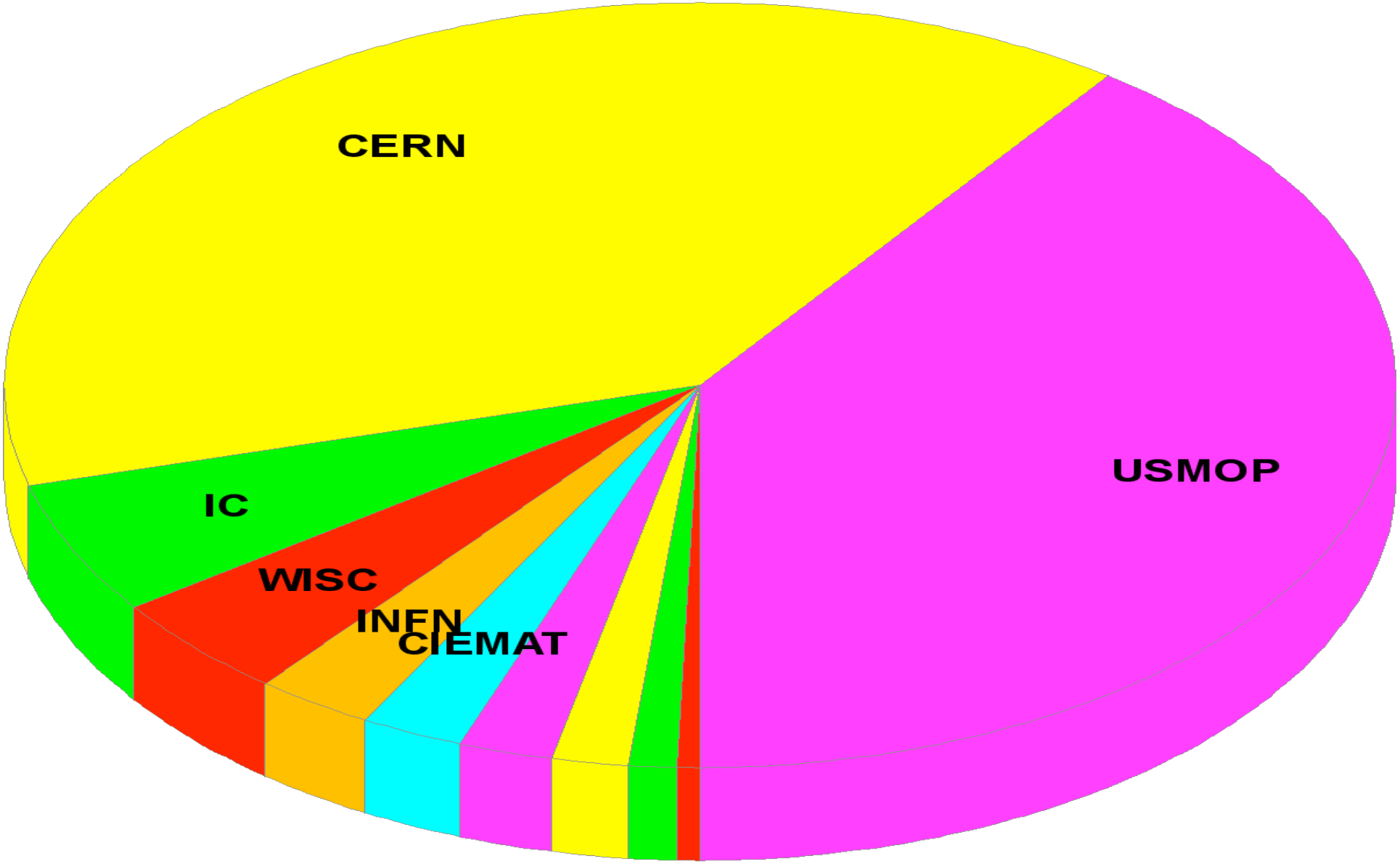
- CMS deliverable tool, responsible of complete life cycle of a single job: Generation, Stage in , Execution,, Stage out, Cleanup.
- http://projects.fnal.gov/runjob/
- Most grid processing done via McRunjob is repetitive and predictable. For example CMKIN,OSCAR, DIGI, DST, etc.


DAG
Submission
McRunJob
Pre Stage In
Submission
Condor-G
RB
SE
Execution
Stage In
SE(dCache)
2. Execution
4. Clean up
1. Stage In
OSG
LCG
3. Stage Out
Stage Out

# Application Generation and Submission cont.

- In OSG, we submit a 4 node DAG to condor-g which executes stage in and stage out on remote head node (CE) and execution and cleanup nodes on the remote cluster (WN).
- In LCG, we submit the single job to RB which first selects the optimal CE (remote head node) , that in turn executes the job on any WN in the cluster (remote cluster). The stage in and stage out operations are also done in WN and is a part of the same job.

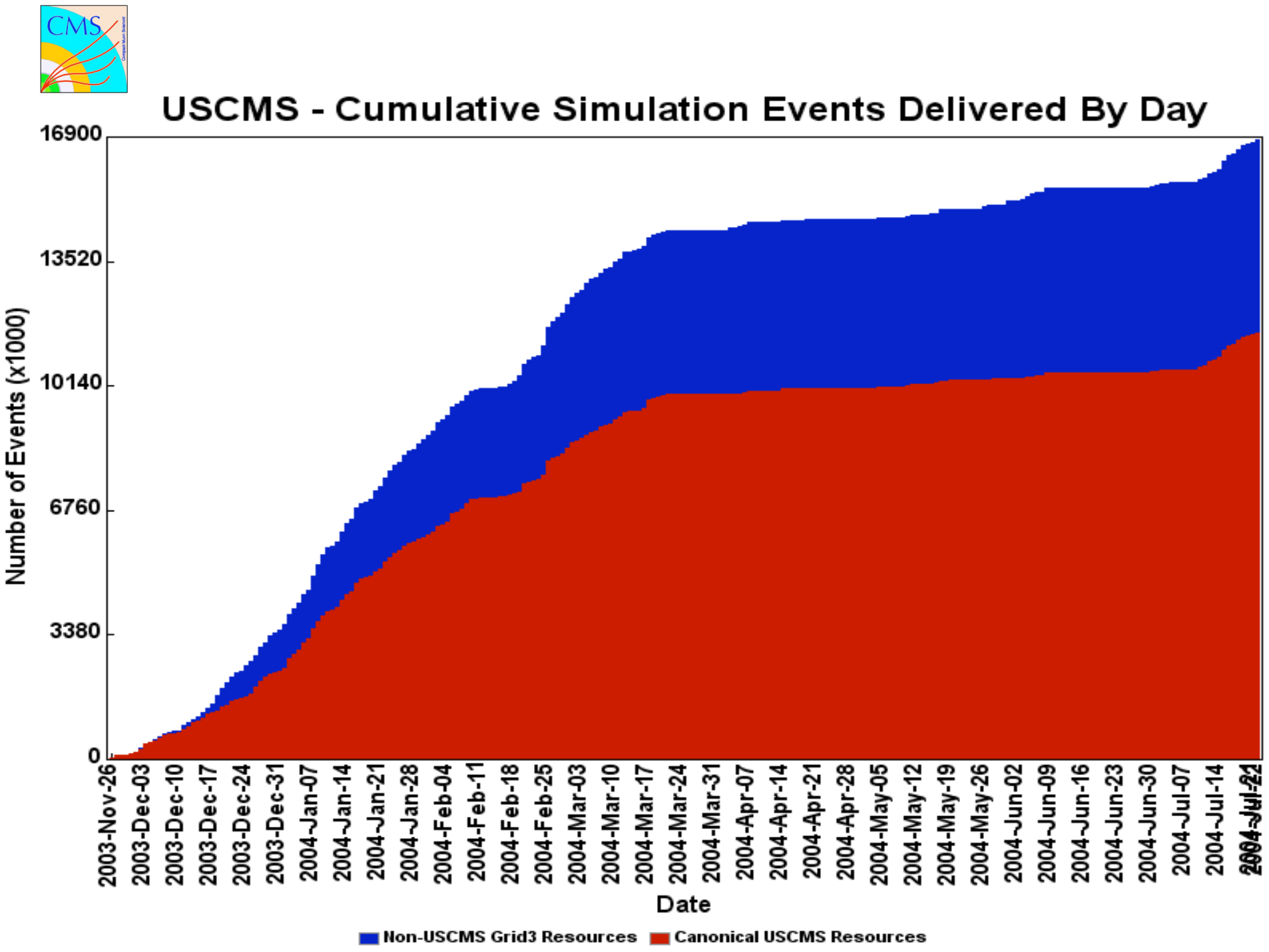
# Simulation Events Produced by Regional Center



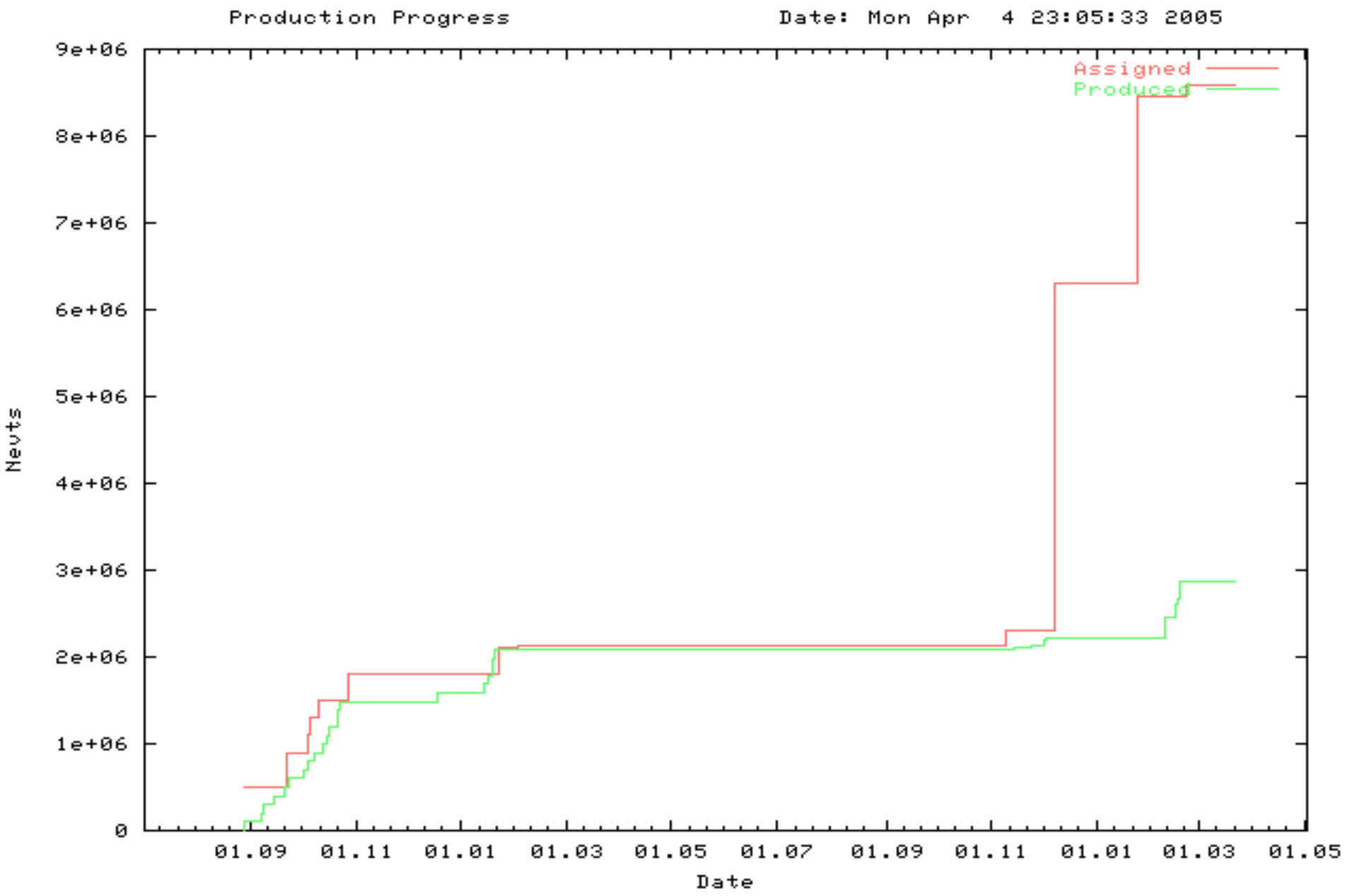

41405957 events produced in total between 20031115 and 20050131

# CMS Events Production at OSG

- USMOP events are produced using McRunjob and they utilized most of the OSG Grid resources.
- Other events were produced at each center locally.
- We are aiming to use the grid as much as possible to reduce the number of human intervention in running the CMS production.
- We are aiming to utilize different grids to further enhance the production process.

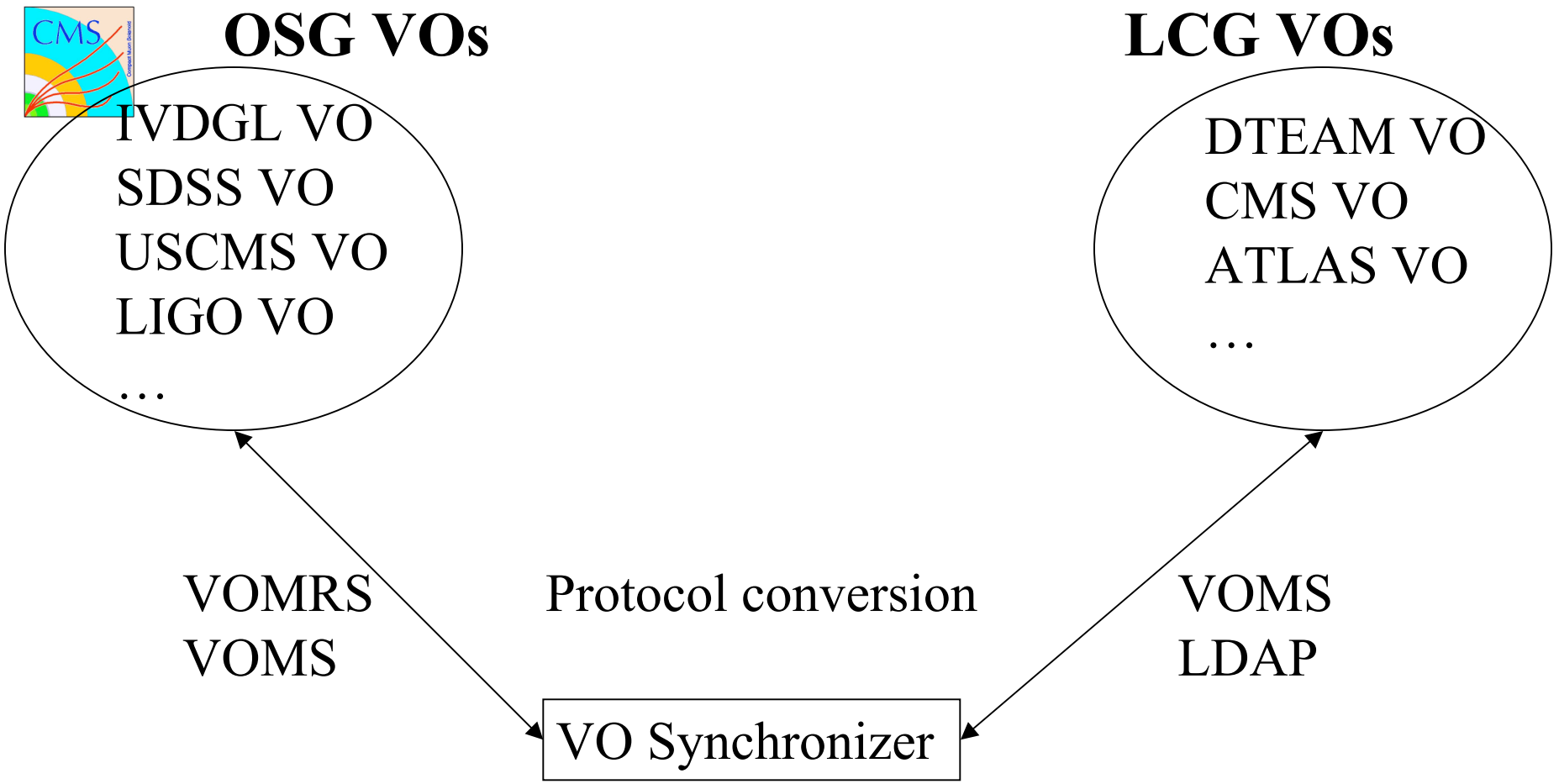

USCMS - Cumulative Simulation Events Delivered By Day
Number of Events (x1000)
16900
13520
10140
6760
3380
0
2003-Nov-26
2003-Dec-03
2003-Dec-10
2003-Dec-17
2003-Dec-24
2003-Dec-31
2004-Jan-07
2004-Jan-14
2004-Jan-21
2004-Jan-28
2004-Feb-04
2004-Feb-11
2004-Feb-18
2004-Feb-25
2004-Mar-03
2004-Mar-10
2004-Mar-17
2004-Mar-24
2004-Mar-31
2004-Apr-07
2004-Apr-14
2004-Apr-21
2004-Apr-28
2004-May-05
2004-May-12
2004-May-19
2004-May-26
2004-Jun-02
2004-Jun-09
2004-Jun-16
2004-Jun-23
2004-Jun-30
2004-Jul-07
2004-Jul-14
Date
Non-USCMS Grid3 Resources
Canonical USCMS Resources

# Simulation events produced at LCG Grid




# Application Execution

- Transparent user authorization
  - Virtual organization (VO) synchronization
- Site exposing multiple interfaces
  - OSG
  - LCG
- Information provider (IP) publishing site information in a coherent way

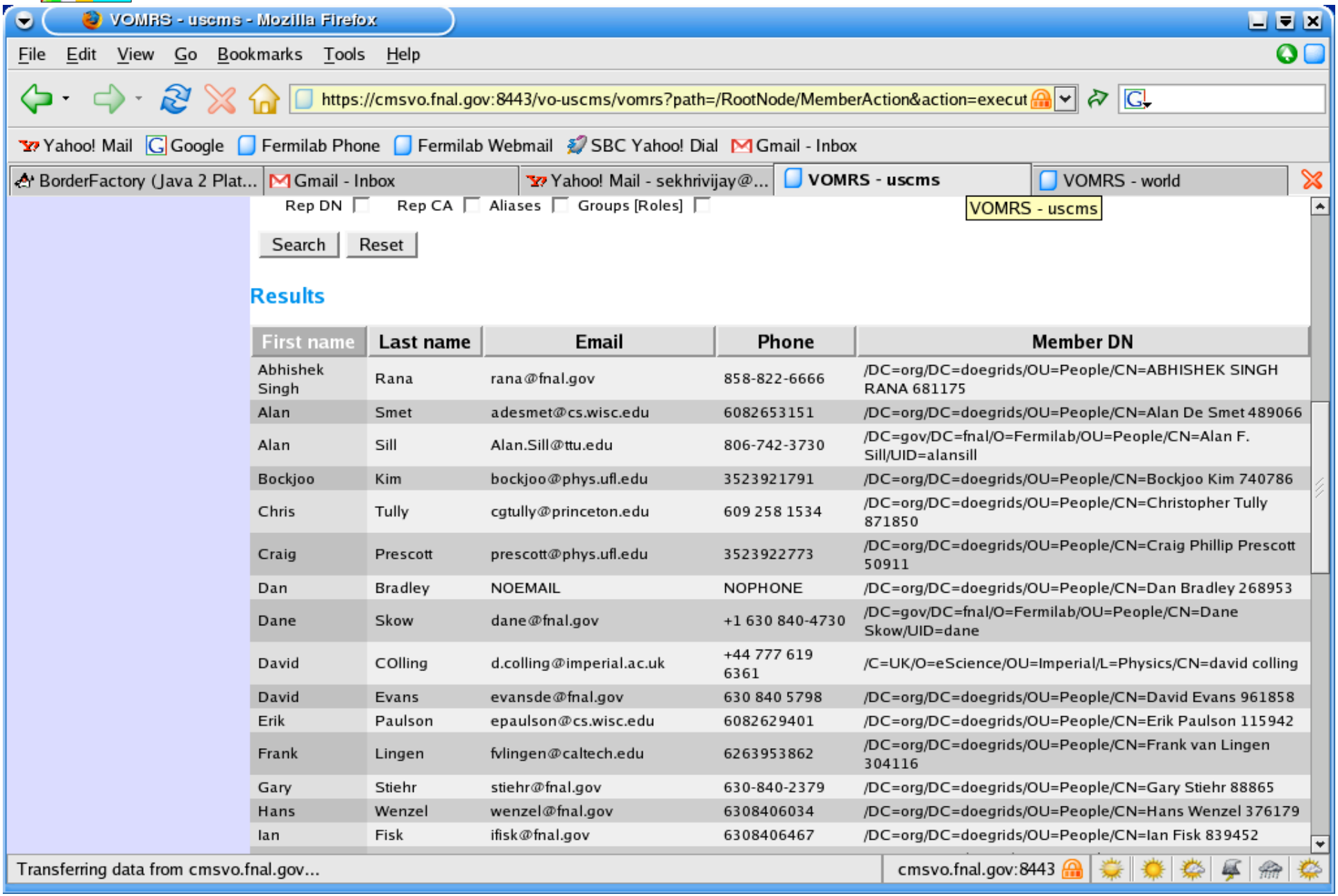



**Transparent User Authorization**

# Transparent User Authorization

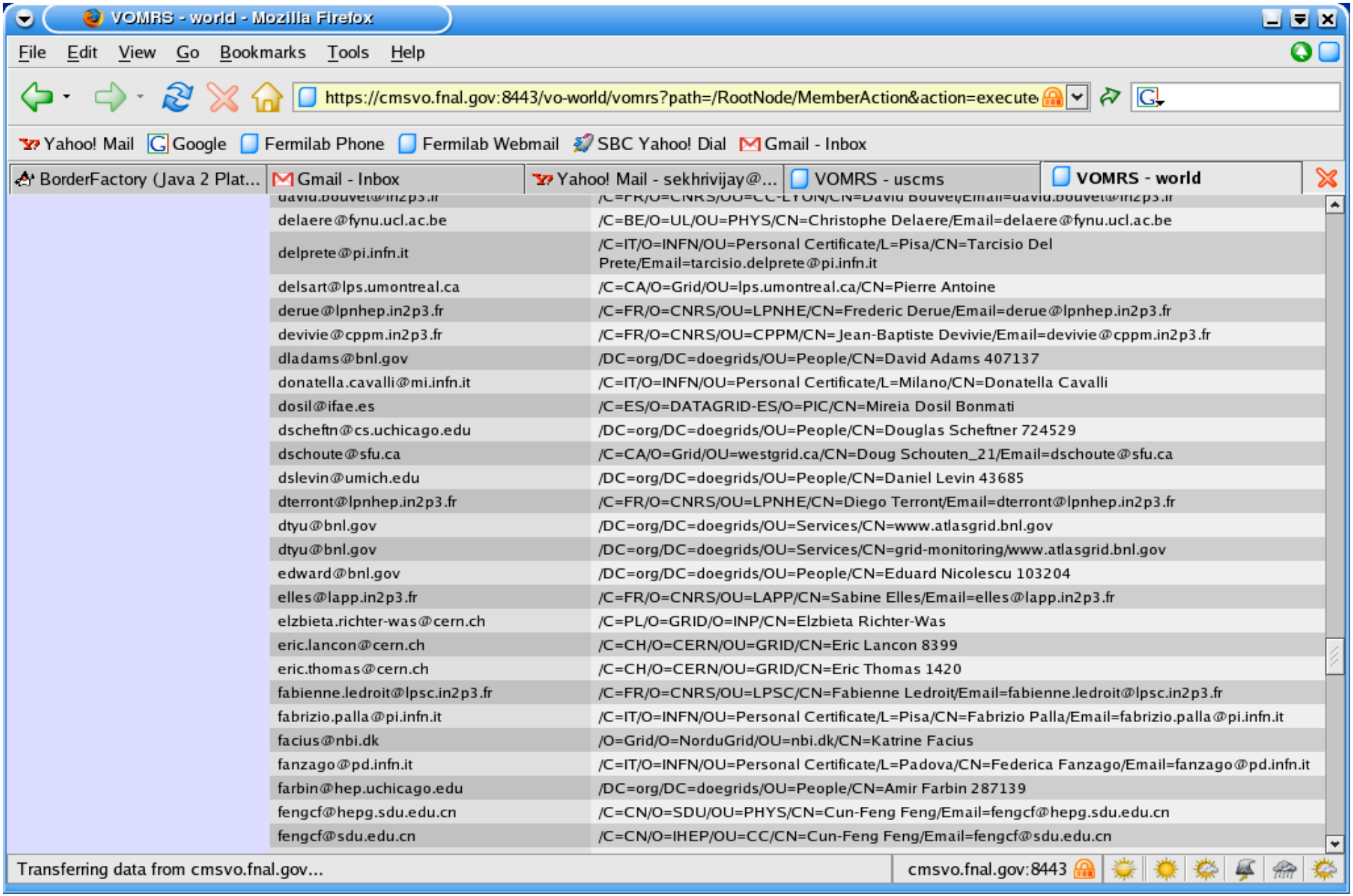
- VOMS is now a part of VDT and is fully supported and easy to install and administer.
- There is an ongoing effort from VDT to smooth out the evolution and version issues of VOMS.
- Vo Synchronizer  enables a user to transparently use both LCG and OSG grids.
- User information from LCG VOs are stored locally in a virtual VO here at FNAL.

# Users from USCMS




| First name | Last name | Email | Phone | Member DN |
|---|---|---|---|---|
| Abhishek Singh | Rana | rana@fnal.gov | 858-822-6666 | /DC=org/DC=doegrids/OU=People/CN=ABHISHEK SINGH RANA 681175 |
| Alan | Smet | adesmet@cs.wisc.edu | 6082653151 | /DC=org/DC=doegrids/OU=People/CN=Alan De Smet 489066 |
| Alan | Sill | Alan.Sill@ttu.edu | 806-742-3730 | /DC=gov/DC=fnal/O=Fermilab/OU=People/CN=Alan F. Sill/UID=alansill |
| Bockjoo | Kim | bockjoo@phys.ufl.edu | 3523921791 | /DC=org/DC=doegrids/OU=People/CN=Bockjoo Kim 740786 |
| Chris | Tully | cgtully@princeton.edu | 609 258 1534 | /DC=org/DC=doegrids/OU=People/CN=Christopher Tully 871850 |
| Craig | Prescott | prescott@phys.ufl.edu | 3523922773 | /DC=org/DC=doegrids/OU=People/CN=Craig Phillip Prescott 50911 |
| Dan | Bradley | NOEMAIL | NOPHONE | /DC=org/DC=doegrids/OU=People/CN=Dan Bradley 268953 |
| Dane | Skow | dane@fnal.gov | +1 630 840-4730 | /DC=gov/DC=fnal/O=Fermilab/OU=People/CN=Dane Skow/UID=dane |
| David | COlling | d.colling@imperial.ac.uk | +44 777 619 6361 | /C=UK/O=eScience/OU=Imperial/L=Physics/CN=david colling |
| David | Evans | evansde@fnal.gov | 630 840 5798 | /DC=org/DC=doegrids/OU=People/CN=David Evans 961858 |
| Erik | Paulson | epaulson@cs.wisc.edu | 6082629401 | /DC=org/DC=doegrids/OU=People/CN=Erik Paulson 115942 |
| Frank | Lingen | fvlingen@caltech.edu | 6263953862 | /DC=org/DC=doegrids/OU=People/CN=Frank van Lingen 304116 |
| Gary | Stiehr | stiehr@fnal.gov | 630-840-2379 | /DC=org/DC=doegrids/OU=People/CN=Gary Stiehr 88865 |
| Hans | Wenzel | wenzel@fnal.gov | 6308406034 | /DC=org/DC=doegrids/OU=People/CN=Hans Wenzel 376179 |
| Ian | Fisk | ifisk@fnal.gov | 6308406467 | /DC=org/DC=doegrids/OU=People/CN=Ian Fisk 839452 |

# Users from Cern CMS, Atlas and Dteam

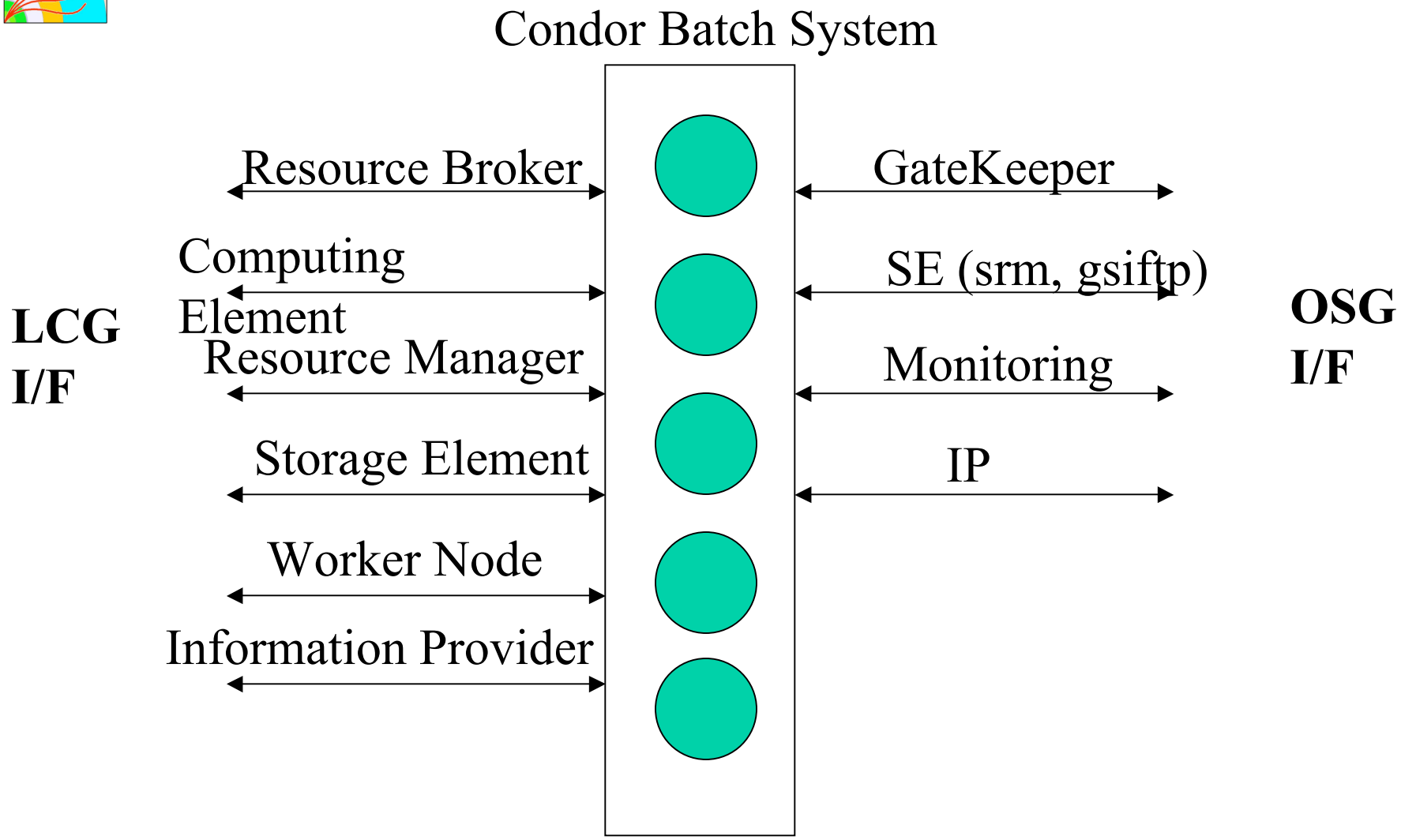



# VOMRS

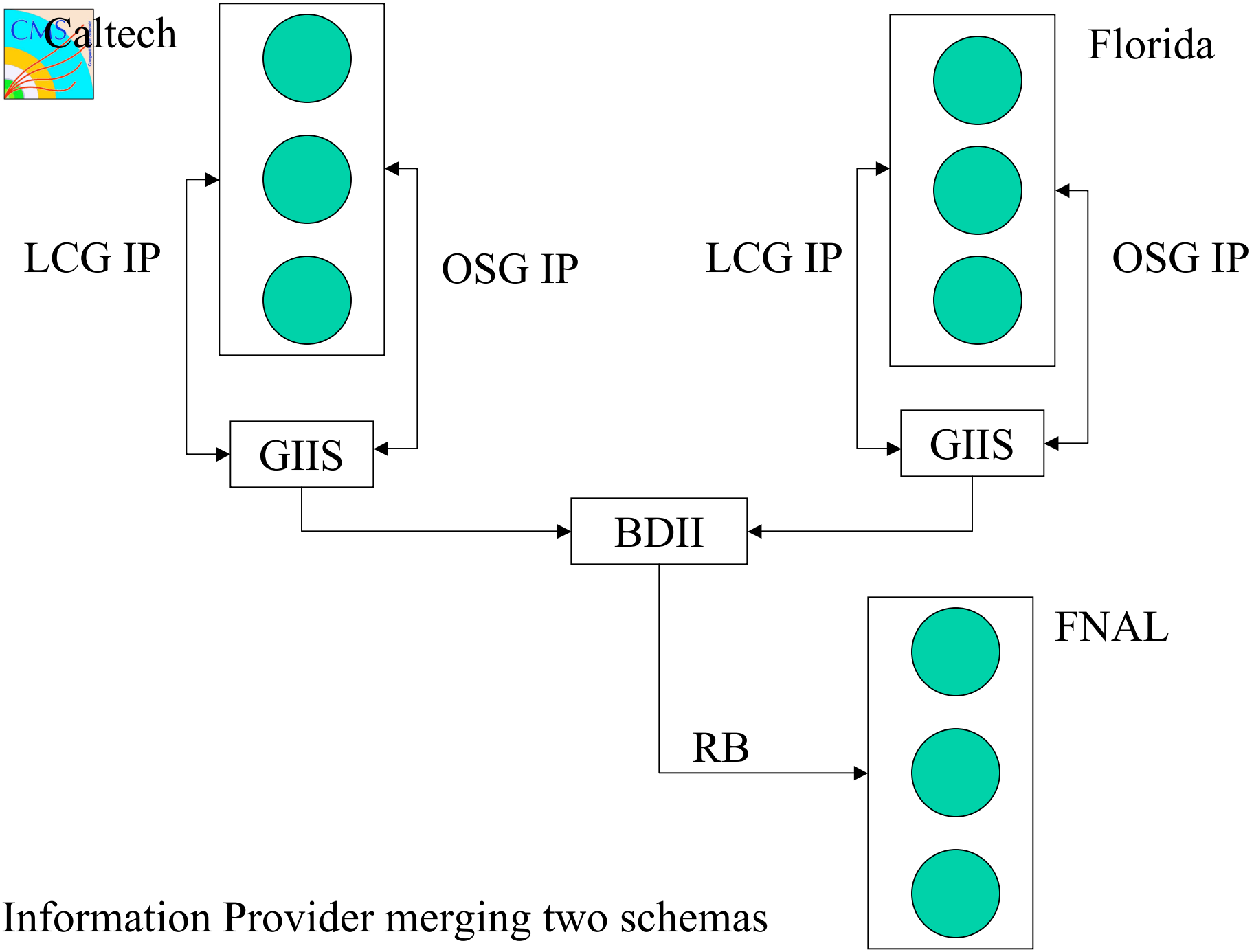
- VOMRS is a server that provides the means for registering members of a VO, and coordination of this process among the various VO and grid resource administrators.
- It consists of a database to maintain user registration and institutional information, and a web user interface (web UI) for input of data into the database and manipulation of that data.
- Work is being done to integrate it with VDT


# Basic Features

- Registration
- Approval, Suspension, Denial
- Multiple DNs
- More Private Information
- Multiple VOAdmins
- Multiple Representatives
- Groups
- Roles
- Institutions and Sites




Site exposing multiple IFs at FNAL




Information Provider merging two schemas


# Outlook

- We have demonstrated reasonable use of grid resources for CMS production.
- We have implemented and prototyped some routines to achieve interoperability at various levels.
- Work is being done to completely merge the information provider's schema for different grid types.
- Having long term compatibility with accounting information is the goal for future.